Non-CO_2 Greenhouse Gases: Methane

Source/Sectors: Natural Gas Systems (Production; Processing; Transmission and Distribution)

Technology: Replace gas starters with air (A.1.2.1.12; A.1.2.3.10)

Description of the Technology:
In the United States and worldwide, many efforts have been made to identify and implement mitigation options to reduce methane emissions from the natural gas sector (USEPA, 2003). For example, the Natural Gas STAR program is a voluntary partnership between US EPA and the oil and gas industry to identify and implement cost-effective technologies and measures to reduce methane emissions. The measures to reduce methane emissions from the natural gas systems can be grouped into the following mitigation strategies: prevention, recovery and re-injection, recovery and utilization, and recovery and incineration (Hendriks & de Jager, 2001).

Small gas expansion turbine motors are often used to start internal combustion engines for compressors, generators, and pumps in natural gas production. These starters use compressed natural gas to provide the initial push to start the engine, but use of them results in methane emissions. Replacing natural gas with air will completely eliminate the venting of methane (Fernandez *et al.*, 2005). Partners of the Natural Gas Star Program have found that replacing the natural gas with compressed air for engine starting can reduce methane, volatile organic compounds (VOCs), and hazardous air pollutants (HAPs) emissions.

Effectiveness: A methane emissions saving of 500 Mcf per year for multiple applications were reported (USEPA, 2008).

Implementability: This practice is applicable for all natural gas pneumatic starter motors.

Reliability: Reported methane emissions savings of 1,356 Mcf per year apply to one 3,000-horsepower reciprocating compressor that requires 10 startups per year. The compressor starter open-ended line is assumed to have average leakage (USEPA, 2008).

Maturity: Good

Environmental Benefits: Methane emissions reduction

Cost Effectiveness: The capital cost is the installation of piping between an existing air compressor and the starter is assumed to be incremental to the cost of the air compressor already used for pneumatic controls. Operating cost includes the electrical power needed to compress the air. Associated benefits include reduced VOC and HAP emissions (USEPA, 2008).

- Capital Costs (including installation): <$1,000
- Operating and Maintenance Costs (annual): $100 - $1,000
- Payback (Years): 0-1

Industry Acceptance Level: Fair

Limitations: A stationary or mobile air compressor is required for this practice.

Sources of Information:
1. California Energy Commission (2005) “Emission Reduction Opportunities for Non-CO_2

Greenhouse Gases in California", a report prepared by ICF Consulting for California Energy Commissions, CEC-500-2005-121, July 2005.

2. Hendriks, C.; de Jager, D. (2001) "Economic Evaluation of Methane Emission Reductions in the Extraction, Transport and Distribution of Fossil Fuels in the EU: Bottom-up Analysis", A final report to European Commission.
3. International Energy Agency (2003) "Building the Cost Curves for the Industrial Sources of Non-CO_2 Greenhouse Gases", Report Number PH4/25, IEA Greenhouse Gas R&D Programme, Cheltenham, United Kingdom, October 2003.
4. International Energy Agency (2003) "Building the Cost Curves for the Industrial Sources of Non-CO_2 Greenhouse Gases", Report Number PH4/25, IEA Greenhouse Gas R&D Programme, Cheltenham, United Kingdom, October 2003.
5. International Energy Agency (2003) "Building the Cost Curves for the Industrial Sources of Non-CO_2 Greenhouse Gases", Report Number PH4/25, IEA Greenhouse Gas R&D Programme, Cheltenham, United Kingdom, October 2003.
6. U.S. Climate Change Technology Program (2005) "Technology Options for the Near and Long Term", U.S. Department of Energy, http://www.climatetechnology.gov/index.htm, August 2005.
7. U.S. Environmental Protection Agency (2003) "International Analysis of Methane and Nitrous Oxide Abatement Opportunities: Report to Energy Modeling Forum, Working Group 21", a report prepared by ICF Consulting for the United States Environmental Protection Agency.
8. U.S. Environmental Protection Agency (2004a) "International Methane and Nitrous Oxide Emissions and Mitigation Data", United States Environmental Protection Agency. Available online at www.epa.gov/methane/appendices.html (in Excel file).
9. U.S. Environmental Protection Agency (2004b) "Convert Engine Starting to Nitrogen", PRO Fact Sheet No. 101,http://www.epa.gov/gasstar/pdf/pro_pdfs_eng/convertenginestartingtonitrogen.pdf, Natural Gas Star Program, U.S. EPA, Washington DC, 2004.
10. U.S. Environmental Protection Agency (2008), Natural Gas Star Program, http://www.epa.gov/gasstar/index.htm, U.S. EPA, Washington DC, 2004.